if the wide bearing and extraordinary usefulness of his experiments could have been foreseen by him, they were certainly hidden from the world at large.

The laws of nature can not be intelligently applied until they are understood, and in order to understand them, many experiments bearing upon the fundamental nature of things must be made, in order that all may be combined in a far-reaching generalization impossible without the detailed knowledge upon which it rests. When mankind discovers the fundamental laws underlying any set of phenomena, these phenomena come in much larger measure than before his control, and are applicable for his service. Until we understand the laws, all depends upon chance. Hence, merely from the practical point of view, concerning the material progress of humanity, the exact understanding of the laws of nature is one of the most important of all the problems presented to man; and the unknown laws underlying the nature of the elements are obviously among the most fundamental of these laws of nature.

Such gain in knowledge brings with it augmented responsibilities. Science gives human beings vastly increased power. This power has immeasurably beneficent possibilities, but it may be used for ill as well as for good. Science has recently been blamed by superficial critics, but she is not at fault if her great potentialities are sometimes perverted to serve malignant ends. Is not such atrocious perversion due rather to the fact that the ethical enlightenment of a part of the human race has not kept pace with the progress of science? May mankind be generous and high-minded enough to use the bountiful resources of nature, not for evil, but for good, in the days to come!

THEODORE W. RICHARDS
HARVARD UNIVERSITY

PROCEEDINGS OF THE BALTIMORE MEETING OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

THE seventy-first meeting of the American Association for the Advancement of Science was held at Baltimore from December 23 to 28, and in view of the unusual conditions it has been a decided success. It will be remembered that the meeting place was changed from Boston to Baltimore, partly because war conditions had brought together at Washington scientific men from all over the country, and it was planned to have a brief compact program devoted to war issues and topics more intimately pertinent to the immediate welfare of the country. While it was not feasible to have the meetings in Washington, it was thought that members in Washington might be able to attend meetings at Baltimore, but a short distance away.

With the sudden termination of hostilities the problems confronting the scientific workers have to a large extent either suddenly changed their nature altogether or have been considerably modified and, although but a short time has intervened since the signing of the armistice, the nature of the contributions and discussions in the various meetings shows a quick recognition and adjustment to these changed conditions.

The rapid release of men by demobilization and the prevalent less congested conditions as to university buildings and hotel accommodations have apparently been partly responsible for the surprisingly large enrollment. The opening meeting at McCoy Hall on the evening of December 26 had an attendance of about four hundred people, and the total registration for the week was seven hundred and twenty-eight, which did not include some of the members of the various affiliated societies. At the opening meeting Dr. Edward L. Nichols announced that the address of the retiring president of the association, Dr. Theodore W. Richards, on "The Problems of Radioactive Lead" would not be given, Dr. Richards being

unable to attend the meeting on account of illness. Dr. Nichols then introduced the president-elect, Dr. John M. Coulter, who in turn presented President Goodnow, of the Johns Hopkins University.

In his address of welcome Dr. Goodnow spoke as follows:

It is my privilege on behalf of the Johns Hopkins University to bid you welcome here to-night. It has been a great pleasure for us to feel that we have been able even in a small way to be of service to you on the occasion of this meeting.

It is always an honor for a university to cooperate with the association. But, at the present time, it is peculiarly gratifying to have the opportunity of testifying to the worth of the work which men of science have been and are now doing.

Science has within the past few years assumed perhaps a greater importance than it has ever before had, or, at any rate, the accomplishments of science have bulked larger in the public eye than heretofore. The struggle which has just closed has probably made greater demands on the scientific man than have ever hitherto been made. Science has, indeed, been forced to become the servant of Mars. The great war has called upon men of science to devise new weapons of both offense and defense. Without their efforts it would have been a very different conflict from what it has been.

The ruthlessness with which our knowledge of scientific law has recently been applied to the destruction of life and property has, I am afraid, however, caused not a few to entertain a certain amount of apprehension as to the effects upon human life of scientific training. If a greater scientific knowledge is to bring with it the will to use that knowledge as it has been used during the past four years, civilization, which has been the product of so many centuries of human endeavor, would seem to have a perilous future.

Such apprehensions are, however, I am sure, quite unfounded. Science, it is true, is in large measure unmoral. It has to do with natural law rather than with human relationships, and it is with human relationships that morality is concerned. Knowledge, of course, is power, and power or might is not necessarily right.

We are told, it is true, that man can not live by bread alone. But that is not to say that he does not live at all by bread. He must have bread and he must have science. We must, so long as we live, attempt to increase our knowledge. We must endeavor through science to acquire power, to conquer Nature, to learn from her how best we may live.

But that endeavor need not prevent us from at the same time striving to live well-ordered lives, to form a social organization in which right relationships shall be established, in which right rather than might shall be controlling. We may at the same time search for truth and labor for the adoption of ethical standards in accordance with which our knowledge of science may be applied.

I have said that in no period in the past has science assumed such importance as in the last four years. I may add that the rôle of science in the immediate future will be of even greater significance. In the period of reconstruction upon which we are now entering, science will be called upon to bind the wounds of a bleeding world sick almost unto death. It must in some way show us how to increase production in order that we may feed the starving, house those without shelter, and clothe the naked. Never before have the demands upon the scientific man been so insistent as they soon will be. And fortunately they will be demands which he can meet without any secret lurking thought that his success will be followed by sorrow and misery. He can rejoice in the belief that his efforts will bring comfort to many whose lot has been hopelessness if not despair.

For this reason I congratulate you men of science upon the opportunity which now presents itself. We are living in a very different world from that which existed only four years ago. Old traditions have been cast aside. New standards are in process of adoption. Great impetus has been given to the belief in the necessity of scientific research.

I wish you all success in this, your first meeting in the new era upon which we are just entering.

In behalf of the Association the response to President Goodnow's welcome was made by Dr. Coulter, as follows:

In behalf of the association, I wish to express our appreciation of the greeting extended by President Goodnow. Johns Hopkins University is a peculiarly fitting place for a meeting of the American Association, for historically it is our first research university, an example and a stimulus to the other universities of the country. Those

of us who are older can recall the distinguished names that brought to Johns Hopkins its prestige in research.

President Goodnow has characterized science as a power let loose for destruction during the late war, a giant that has discovered its strength. Everything depends upon how the power is applied, but I am sure that science prefers to apply its strength in public service rather than in destruction. The great war has been called a war of science, but I trust that this kind of service that science has been called upon to render is but a prelude to a recognition of the fact that the progress of a peaceful civilization is also based upon scientific research.

Speaking for this association, I am sure that we are ready to pledge ourselves to use our science in constructive work, for the advancement of knowledge and for the public welfare.

In accordance with the present constitution, notice was served by Dr. Edward L. Nichols that a revised constitution and by-laws will be presented next year to be voted upon, the principle changes being those of increase in the number of sections and a condensation in form of the present constitution.

Meeting in affiliation with the association were twenty-one other organizations, as follows, many of these affiliated societies having certain sessions in conjunction with corresponding sections of the association:

American Federation of Teachers of the Mathematical and Natural Sciences,
American Physical Society,
Optical Society of America,
Society for Promotion of Engineering Education,
Geological Society of America,
Association of American Geographers,
Paleontological Society of America,
American Society of Naturalists,
American Society of Zoologists,
American Association of Economic Entomologists,
Botanical Society of America,
American Phytopathological Society,
Ecological Society of America,
American Anthropological Association,
American Psychological Association,
American Folk-Lore Society,
American Metric Association,
Society of American Bacteriologists,
American Society for Horticultural Science,
Society of American Foresters,
School Garden Association of America.

Two of the affiliated societies met on Monday and Tuesday in advance of the opening meetings of the association: The School Garden Association of America and the American Phytopathological Society, the sessions of the latter organization continuing till Saturday.

The various meetings were held in Gilman, Hall, the Civil Engineering Building, and the Mechanical and Electrical Engineering Building, at the splendid new site of Johns Hopkins University at Homewood, towards the northern part of Baltimore, and the accommodations for the meetings of the various societies and sections were found to be convenient and amply sufficient. Inexpensive and ample lunches were provided in the Mechanical and Electrical Engineering Building.

There were held perhaps the usual numbers of dinners and smokers, at which addresses of retiring presidents, invitation papers, or other interesting features were presented. The Phytopathological Society had a dinner on Wednesday evening and the Ecologists an informal dinner on Thursday evening, while after the opening session of the association, the biologists gathered for an informal smoker. On Friday evening, dinners were held by the botanists, the American Metric Association, the American Society for Horticultural Science, while the Society of American Foresters had a smoker and "Round Table Talks." On Saturday night the American Society of Naturalists held a dinner, at the close of which Vernon L. Kellogg was to have spoken on "The German Philosophy of the War" but was detained in France. The annual dinner of

the Geological Society was held at the same time elsewhere. The Association of University Professors met on Saturday at the Hopkins Club.

In the Botanical Laboratories in Gilman Hall there was displayed an exhibit showing the use of sphagnum moss in the preparation of surgical dressings, as prepared by Dr. Geo. E. Nichols, Botanical Adviser on Sphagnum for the American Red Cross.

Some of the most noticeable features of the Baltimore meeting were the tendency towards cooperation and team-work among investigators, attacking problems jointly under well-developed plans, and the considerable number of notable addresses, often given by men of large responsibilities in governmental or war work and relating the problems of reconstruction. The experiences of the past two years have had an important bearing on methods of research and an important address was that given by Dr. George E. Hale, entitled "The National Research Council," in which the future organization and functioning of that institution were discussed. Altogether it is probably safe to state that about four hundred addresses and shorter papers were presented at the various meetings.

The addresses of the retiring vice-presidents were as follows:

Section A.—Henry Norris Russell, on "Some problems of sidereal astronomy."

Section B.—W. J. Humphreys, on "Some recent contributions to the physics of the air."

Section C.—William A. Noyes, on "Valence."

Section D.—Henry Sturgis Drinker, on "The need of conservation of our vital and natural resources as emphasized by the lessons of the war."

Section E.—George Henry Perkins, on "Vermont physiography."

Section F.—Herbert Osborn, on "Zoological aims and values."

Section G.—Burton E. Livingston, on "Some responsibilities of botanical science."

Section H.—E. L. Thorndike, on "Scientific personnel work in the army."

Section L.—Edward F. Buchner, on "Scientific contributions of the educational survey."

Section M.—Henry J. Waters, on "The farmer's gain from the war."

As honorary associates of the Baltimore meeting the council elected Dr. Professor Fabio Frassetto, of the University of Bologna and now of the Royal Italian Embassy at Washington, and Dr. Georgio Abetti, vice-secretary of the Italian Society for the Advancement of Science, both of these men being in attendance at the meetings.

The next meeting of the association will be held in St. Louis, beginning the first Monday after Christmas, 1919. The results of elections of officers for the ensuing year were as follows:

President: Simon Flexner, director of the Rockefeller Institute for Medical Research, New York City.

Vice-Presidents:

Section B.—Theodore Lyman, Harvard University, Cambridge, Mass.

Section C.—B. F. Lovelace, The Johns Hopkins University, Baltimore, Md.

Section E.—C. K. Leith, University of Wisconsin, Madison, Wis.

Section F.—Wm. M. Wheeler, Bussey Institution, Boston, Mass.

Section G.—L. H. Pammel, Iowa State College, Ames, Iowa.

Section H.—R. M. Yerkes, University of Minnesota, Minneapolis, Minn.

Section L.—V. A. C. Henmon, University of Wisconsin, Madison, Wis.

Section M.—A. F. Woods, Maryland Agricultural College, College Park, Md.

Secretary of the Council: J. F. Abbott, Washington University, St. Louis, Mo.

General Secretary: Geo. T. Moore, Missouri Botanic Garden, St. Louis, Mo.

Nine men were elected members of the committee on grants, as follows: N. L. Britton, Louis I. Dublin and J. McK. Cattell for one year; G. N. Lewis, W. B. Cannon, and R. T. Chamberlin for two years; and Henry Crew, Joel Stebbins, and G. H. Parker for three years.

To fill vacancies in the council of the association Drs. N. L. Britton and J. McK. Cattell were reelected and Dr. J. C. Merriam was elected as a new member. Dr. E. F. Buchner was appointed to represent the association in the American Council of Education, and J. C. Merriam, H. B. Ward, and Stewart Paton were elected to serve for three years on the Committee on Policy.

The report for 1918 of the treasurer of the association, Dr. Robert S. Woodward, showed total cash receipts of $7,747.27 and disbursements $7,786.00, including the purchase of $4,000 Liberty Bonds. The total funds of the association are now $116,605.45.

The financial report of the permanent secretary, L. O. Howard, for the period November 1, 1917, to October 30, 1918, showed receipts $43,784.49 and expenditures of $36,209.04, leaving a balance of $7,575.45.

The two financial reports will be printed in full in a later issue of SCIENCE.

O. E. JENNINGS,
General Secretary.

SCIENTIFIC EVENTS

THE KATMAI NATIONAL MONUMENT

PRESIDENT WILSON has created by proclamation the Katmai National Monument. This reservation incloses what the explosive eruption of June, 1912, left of Mount Katmai, on the southern shore of Alaska, together with several neighboring valleys of steaming vents, the largest of which the National Geographic Society, which explored it in June, 1917, named the "Valley of Ten Thousand Smokes."

The two features are intimately related. Rock strata superheated since the great eruption underlie Katmai near enough to the surface to turn to instant steam the spring and drainage waters of many a surrounding mile of foothills. Thus originates the steam which bursts from the myriad valley vents. The phenomenon is familiar in the neighborhood of most volcanoes which still are classed as active. Steaming springs, a later stage of the vents in this valley, are found upon the flanks of several of the most prominent of our Cascade volcanoes, and are numerous around the base of Lassen Peak.

The comparison, however, between Katmai's steaming valleys and the geyser basins of Yellowstone is especially instructive because Yellowstone's basins once were what Katmai's steaming valleys are now. The "Valley of Ten Thousand Smokes" is probably a coming geyser field of enormous size. The explanation is simple. Bunsen's geyser theory, now generally accepted, presupposes a column of water filling the geyser vent above a deep rocky superheated chamber in which trickling spring water is being rapidly turned into steam. When this steam becomes plentiful enough and sufficiently compressed to overcome the weight of the water in the vent, it suddenly expands and hurls the water out. That is what makes the geyser play.

Now, the difference between the Yellowstone geyser fields and Katmai's steaming valleys is just a difference in temperature. The entire depth of earth under these valleys is heated far above boiling point, so that it is not possible for water to remain in the vents; it turns to steam as fast as it collects and rushes out at the top in continuous flow. But when centuries or hundreds of centuries enough elapse for the rocks between the surface and the deep internal pockets to cool, the water will remain in many vents as water until, at regular intervals, enough steam gathers below to hurl it out. Then these valleys will become